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PATENT SPECIFICATION



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444,433

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COMPLETE SPECIFICATION

**Improvements in or relating to Cycle Drives**

I, WILHELM GOECKEL, of Bergerhof bei Radevormwald, (Rheinland), Germany, a German citizen, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention relates to cycle drives with change speed gear, more particularly for use in hilly country, which enable by the insertion of a low transmission ratio, gradients to be taken with less power than would be required when using the normal transmission ratio designed for level roads.

A considerable number of cycle drives provided with changespeed gear is known. These drives are not in general use, chiefly owing to their complicated construction, difficult operation and lack of smoothness in running.

According to the invention a cycle drive with a change speed gear, consisting of an intermediate chain drive enclosed within the pedal crank shaft casing, is characterised by the fact that the change speed gear contains a driver provided with a free wheel device, which is operated by back pedalling and serves for operating a rear wheel brake.

By this means the invention renders it possible to operate the rear wheel hub brake by back pedalling, even in the disengaged position of the change speed gear. If therefore the rear wheel is coupled with the chain drive only during forward pedalling, whilst otherwise running free, it can in any position of the change speed gear be braked by mere back pedalling. It is therefore possible without interfering with the mode of operation and simple control of the change speed gear, to employ an ordinary clutch disc which is brought from a middle position of rest into engagement with either the one or the other of two chain driving gears rotatably mounted upon the pedal shaft. The new drive is therefore distinguished by very great simplicity as regards construction and operation and very considerable safety in operation and running.

In order to obtain light running in spite

of the interposed chain drive, the chains of the interposed drive may be arranged to run in an oil bath provided in the pedal shaft bearing casing. The chain drive leading to the rear wheel hub may also be enclosed by a chain casing in the lower portion of which oil may be contained for continuously lubricating the chain. By this arrangement the efficiency of the drive is further improved.

The drawings show by way of example one construction embodying the features of the invention.

Fig. 1 is an elevation, the casing being partly removed,

Fig. 1a is a cross section, through the chain drive box,

Fig. 2 is a horizontal median section through Fig. 1 on line B—B.

In the illustrated constructional example, *a* indicates the pedal crank shaft, which carries upon its ends *a'*, in known manner, two pedal cranks *b*, and is mounted in ball bearings *c*. The ball bearings *c* are carried in the usual manner by a casing *f* fixedly connected with the cycle frame *d*, said casing being provided with openings *g* for the insertion of the shaft *a* and the bearings *c*, the openings being closed by means of caps *h*. Between the bearings *c* there are rotatably mounted upon the pedal crank shaft *a* by means of ball bearings *i*, two chain wheels *k*, *m*. Between these wheels is mounted upon the crank shaft a disc *n* adapted to co-operate with carrier pins *o* of the two chain wheels. The disc is non-rotatable but slidable upon the shaft. In the middle position of the disc *n* both chain wheels are uncoupled from the shaft, whilst by sliding the disc to the one or the other side, one or the other of the two chain wheels becomes coupled with the crank pedal shaft. The control of the clutch disc *n* is effected by a gear not shown in the drawings, and a lever adapted to be locked in three positions, or the control may be effected by means of a Bowden pull, adapted to be operated in known manner from the steering handle by means of a turnable grip, the Bowden pull being inserted into the pedal crank shaft through

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The chain wheels  $k$ ,  $m$  are connected each by a chain  $p$  and corresponding chain wheels  $k^1$ ,  $m^1$  of smaller diameters or smaller numbers of teeth, with a second shaft  $q$  which is rotatably mounted between the pedal crank shaft and the rear wheel, in the casing  $f$ . In the illustrated example, the numbers of the teeth of the chain wheels,  $k$ ,  $k^1$  are 30 and 10, and those of the wheels  $m$ ,  $m^1$  are 26 and 13 respectively. The transmission ratio of the chain drive  $k$ ,  $p$ ,  $k^1$  is therefore 3:1, and the transmission ratio of the chain drive  $m$ ,  $p$ ,  $m^1$  is 2:1, that is, less. The shaft  $q$  also runs in ball bearings  $r$  and is inserted from the side into the casing through openings  $s$ . At one side, there is provided upon the casing  $f$  a cap  $t$  covering an opening  $s$  and a bearing  $r$  and the end of the shaft  $q$ . At the other end, the shaft  $q$  is provided with an extension  $q^1$  projecting from the casing  $f$ , which carries the driving chain wheel for the chain drive leading to the rear wheel. This chain wheel  $t^1$  is non-rotatably secured to the shaft  $q$ .

At the side remote from the chain wheel  $v$ , the rear wheel hub  $u$  is provided with a brake  $w$  which may for instance be constructed as a jaw brake. This brake is not operated manually but by back pedalling, linkage A, B and a driver C mounted upon the pedal crank shaft  $a$  being provided for this purpose. The driver C is mounted between ball bearing  $c$  and a pedal crank  $b$ , or the pedal crank end  $a^1$  upon the pedal crank shaft  $a$ , and is covered towards the exterior by a cap  $t^2$  and a cap  $h$  fixed to the casing  $f$  of the pedal crank shaft. The driver consists of a disc C fixedly mounted upon the shaft  $a$ , which disc C is provided upon its periphery with a number of recesses D extending in the peripheral direction and containing freely movable rollers F. The disc C is enclosed by the annular portion  $G^1$  of a lever G, to the free end of which is pivoted a rod A leading to the lever operating the rear wheel brake. The recesses D are of a depth increasing in the direction of rotation corresponding to back pedalling action, so that on back pedalling, the rollers F are pressed by the recesses D radially outwardly against the inner annular surface of the lever G. The brake force is then transmitted by the lever G to the pull rod A of the brake lever B and by the latter to the rear wheel brake. On forward pedalling, the driver disc C runs freely in the portion  $G^1$  of the lever G and the rollers then lie in the deepest portions of the recesses D and do not come into contact with the lever G of the operating device. Owing to the arrangement of the driver C,

it is possible to brake by back pedalling, not only when the change speed gear is in action, but also in the middle position of the clutch disc  $n$ . There is therefore no obstacle to the employment of a back pedalling brake in connection with change speed gears, as the possibility of using the brake no longer depends upon the position of the clutch. This arrangement facilitates operation and considerably increases the safety of a cyclist used to a brake operated by back pedalling.

The chain drive  $t^1$ ,  $v$ ,  $x$  connecting the change speed gear with the rear wheel is tightly enclosed by a casing  $y$ . In the lower portion of this casing  $y$  as well as in the lower portion of the casing  $f$ , oil is provided for continuously lubricating the chain  $x$  and the chains  $p$ . This results in smooth running and increased efficiency. For assembling and dismounting the change speed gear, the casing  $f$  is divided at  $z$  below the bearing openings  $g$ ,  $s$ . The improved drive is distinguished by a very simple construction and reliable operation inasmuch as chains only are used for driving, which are less sensitive than toothed gears and are also very easily replaced. Moreover, the gears run in closed oil baths and are therefore protected against dust and mechanical stresses, and offer also only very small frictional resistances.

It will be understood that the invention is not strictly limited to the illustrated constructional example, various modifications and other constructions being possible. More than two transmission ratios might be provided if desired. The free running chain wheels, instead of being arranged upon the pedal crank shaft, might be arranged together with the clutch disc  $n$  and the driver C of the back pedalling brake upon the counter shaft  $g$ . The driver C might, instead of acting upon the lever G act directly upon one of the toothed wheels  $k$ ,  $m$ , in which case, not only the lever G, but also the remaining transmission mechanism for transmitting the brake force, might be dispensed with. In this case, the rear wheel hub might be provided with an ordinary back pedalling brake. The clutch disc itself might be so constructed that on back pedalling, it becomes positively coupled with one of the two toothed wheels. A separate driver would then not be required. Instead of the hub brake, a rim brake might be used. Moreover, the front wheel brake might be operated by back pedalling simultaneously with the rear wheel brake. Finally, the driver might be constructed in a different manner and the transmission to the brake might be effected by a Bowden pull instead

of by linkage.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A cycle drive with a change speed gear, consisting of an intermediate chain drive enclosed within the pedal crank shaft casing, characterised by the fact that the change speed gear contains a driver provided with free wheel device, which is operated by back pedalling and serves for operating a rear wheel brake.

2. Cycle drive according to Claim 1, further characterised by the employment of a known axially displaceable clutch disc carried by the pedal crank shaft, which either engages one of a plurality of chain driving gears rotatably mounted upon the pedal crank shaft, or, when brought into a middle position, allows of the free run of the change speed gear.

3. Cycle drive according to Claims 1 and 2, further characterised by the fact that

the driver is mounted upon the pedal crank shaft.

4. Cycle drive according to Claim 1, further characterised in that the chains of the intermediate chain drive run within an oil bath contained in the pedal crank shaft casing.

5. Cycle drive according to Claims 1 and 2, further characterised in that both the chain driving wheels which are rotatably mounted upon the pedal crank shaft, and the shafts ( $a$ ,  $q$ ) of the intermediate drive are mounted upon ball or roller bearings.

6. Cycle drive according to Claim 1, further characterised in that the chain driving the rear wheel, together with the two corresponding chain wheels ( $t^1$ ,  $v$ ) are enclosed in a casing ( $y$ ) which at the same time contains an oil bath for the chain.

Dated the 12th day of February, 1935.

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[This Drawing is a reproduction of the Original on a reduced scale.]

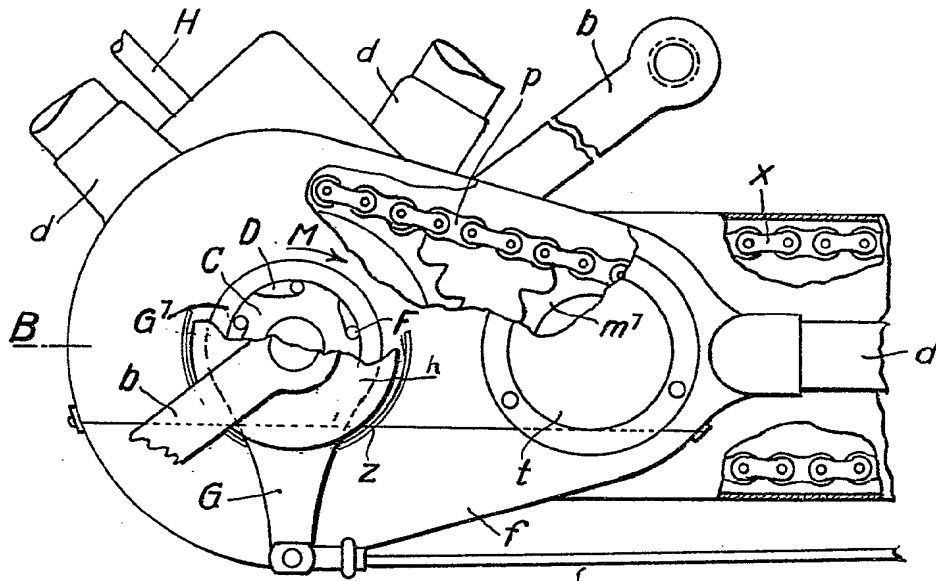


FIG. 1.

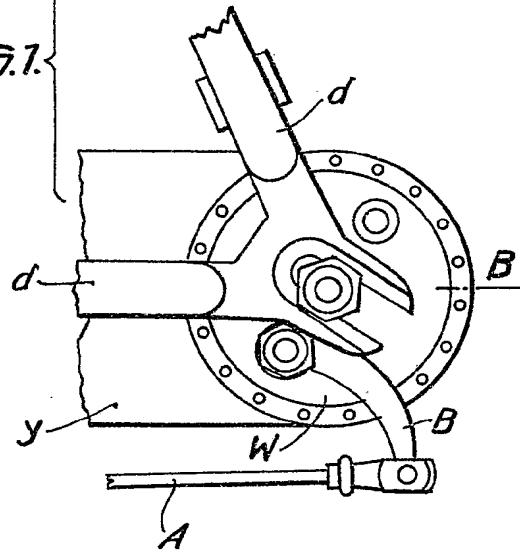
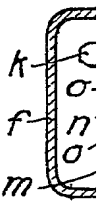


FIG. 1a.



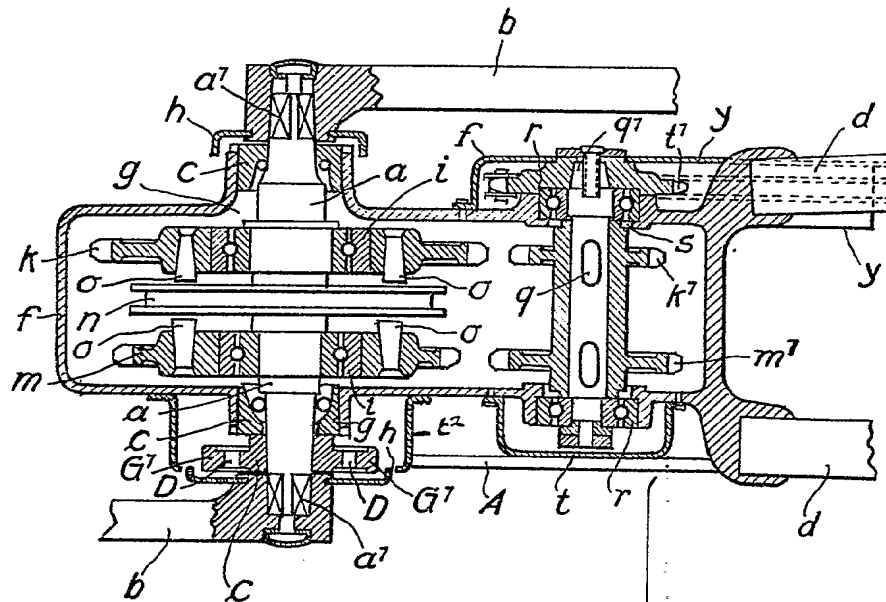
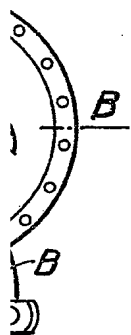
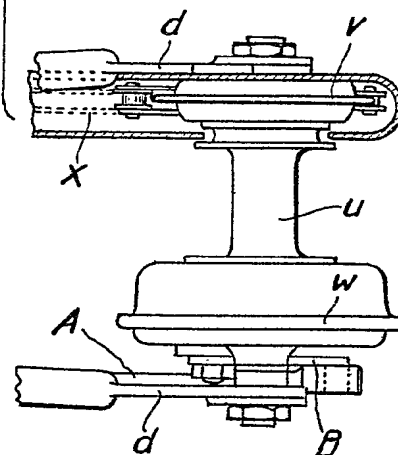
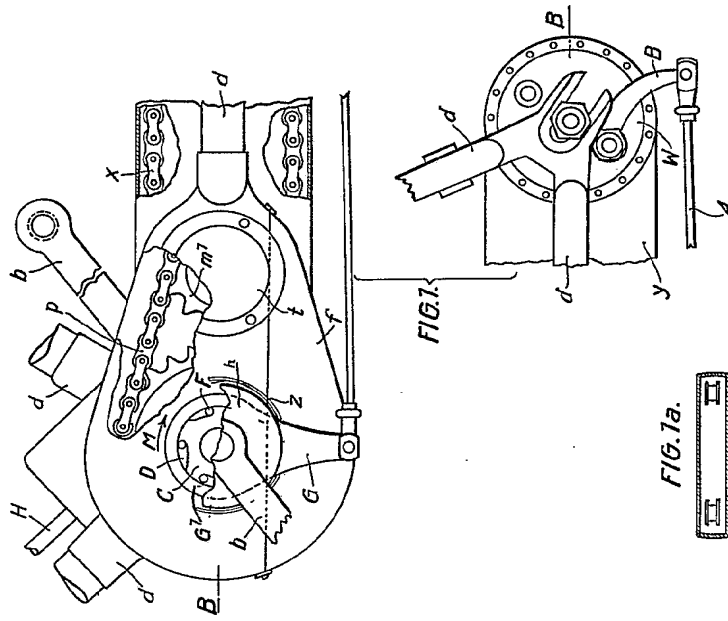


FIG. 2.





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